

amounts exceeding 2.50 inches at a few stations in each State. The largest amount was 4.63 inches on the 21st at Abbeville, Ga.

The least rainfall occurred on the eastern coast of Florida, but less than 1 inch was received at only one place, Malabar, with 0.26 inch.

The average rainfall for the entire district was 5.36 inches and the departure -0.41 inch. The largest amount was 14.80 inches at Robertsedale, Ala., and the least 0.26 at Malabar, Fla. Hail fell at many places with much damage to crops.

#### MISCELLANEOUS PHENOMENA.

The prevailing winds were from the southwest in the States from Alabama to Virginia, but from the southeast in Florida and south in Mississippi. The hourly wind movement slightly exceeded 10 miles at some of the coast stations. The maximum wind velocity reported was 60 miles an hour from the north at Norfolk, Va., on the 2d; gales of 40 miles an hour or more occurred at Cape Henry, Va., at Hatteras, Raleigh, and Charlotte, N. C., at Savannah and Atlanta, Ga., and Jacksonville and Pensacola, Fla.

The average number of clear days was 14, partly cloudy 11, cloudy 6, and rainy 11. The average number of hours of sunshine for the district was 285, or 65 per cent of the possible amount. Highest percentage 79 at Anniston, Ala., lowest 40 at Hatteras, N. C.

#### SEVERE LOCAL STORMS.

*Atlanta, Ga.*—A severe local thunderstorm occurred at Atlanta on July 31, between the hours of 3 and 5 p. m., which presented some rather unusual phenomena. The storm formed southeast of the city and undoubtedly moved eastward, but the entire sky at Atlanta became overcast by thin clouds which permitted sufficient light to pass so that it was comparatively bright during the entire storm. The most striking feature was the absence of the usual outrushing wind; during the disturbance the wind velocity did not exceed 8 miles an hour, and while the rain was heaviest the smoke from chimneys ascended almost vertically upward. From 3.25 to 3.55 p. m. 0.80 inch of rain fell. The electrical display was also brilliant and continuous, and the thunder remarkably loud. The cupola on the Terminal Railway Station was shattered by lightning, and one person was killed.

The writer, although for nearly 30 years an observer in the Weather Bureau, has never before seen anything so nearly approaching ball lightning as was observed during this storm. Very many flashes passed between the clouds and the earth. At the earth terminal of three exceptionally brilliant flashes which occurred in rapid succession and were of the usual reddish color, brilliant globes about the size of a man's head of intensely blue light were observed which lasted for from 3 to 5 seconds after the main flashes had disappeared.

A severe local storm occurred on July 7 at Waycross, Ga., during which large windows were shattered, several houses taken off their foundations, and trees blown down in all parts of the city. A similar storm occurred on the same day at Jackson, Miss., which caused much damage to fruit trees, and at Biloxi, Miss., on the 10th and at Birmingham, Ala., on the 29th.

*Norfolk, Va.*—A severe thunderstorm occurred on July 10, attended by strong gusts of wind over Hampton Roads. Lightning caused damage to buildings and boats along the shore and put the telephones and electric rail-

ways out of commission in Fortress Monroe, Newport News, and vicinity.

*Raleigh, N. C.*—Hail destroyed or damaged crops over small areas in Nash County, N. C., on the 19th, and in Wake and Johnston Counties on the 20th. On a few farms crops were almost completely destroyed, particularly in the vicinity of Fuquay Springs and Smithfield. Some of the hailstones were an inch in diameter. It is estimated that the damage to crops and property in these counties was \$60,000.

#### RIVER CONDITIONS.

Mean river stages were generally normal or slightly below throughout the district during July, and flood stages were not attained at any point.

#### LOCAL STORMS OF JULY 19, 1913, IN VIRGINIA.

[By JAMES H. KIMBALL, Observer.]

Saturday, July 19, opened clear and unusually warm, with light northerly winds sweeping over middle Virginia toward a shallow atmospheric depression, which at 8 a. m. occupied the Piedmont section of North and South Carolina. At Richmond during the morning hours cumulus and strato-cumulus clouds began to appear in the northwest and by noon the sky was partly cloudy and covered with a thin layer of haze. Light northwesterly winds prevailed until about 3 p. m. when, with gathering clouds and an almost imperceptible increase in wind movement, the temperature began to fall, and a few minutes later thunder was heard in the west. About 4 p. m. a northwest squall set in with light rain and a marked fall in temperature. Shortly after 8 p. m. a remarkably beautiful display of mammato-cumulus clouds was observed drifting slowly from the west.

These notes are abstracted from the Richmond record because of their apparent connection with a number of violent storms that occurred on the same day in the adjoining section of middle Virginia.

Hail was the principal agent of destruction, but great loss was also caused by lightning and high winds. Buckingham, Cumberland, Prince Edward, Nottoway, and probably Lunenburg Counties sustained most of the loss, and since these counties form the heart of the Virginia tobacco-growing district their misfortune is of more than local interest. Hail fell in enormous quantities, and large areas of tobacco which had just been topped were almost ruined. The violent electrical discharges caused the destruction by fire of many barns containing recently harvested wheat and oats, while high winds from the northwest unroofed houses and demolished many less substantial buildings.

Of the several storms that occurred between 2 and 4 p. m. on the 19th, the one that developed in central Buckingham County was undoubtedly the most severe. It began to show destructive properties when nearing Enonville, a village in the south-central part of the county, where a heavy thunderstorm occurred at about 2.30 p. m. Thence it traveled in a southeasterly direction and was next reported from Arcanum, about 4 miles distant, where the lightning was severe. Four large trees standing within a comparatively small area are said to have been shattered from top to bottom by successive discharges within a 5-minute interval. Rain and hail occurred, but these features did not become excessive until the storm reached Sheppard, a village 5 miles to the south-southeast.

From a full and interesting account forwarded from Sheppard by Mr. P. M. Jones the following brief summary has been taken: Shortly before 3 p. m. the storm appeared suddenly in the north-northwest, moving in an easterly direction, apparently toward Curdsville, but when northeast of that place it curved to the south and was overtaken by a second storm from the northwest. From the point of meeting the reenforced disturbance moved southeast with greatly increased intensity, prostrating nearly everything in its path. The destruction was apparently caused by a straight wind. Three miles northeast of Sheppard the north sides of forest trees were stripped of their bark and from that side appeared white and bare. The lightning was not intense, but the rain and hail increased greatly in intensity, and the loss to property in the vicinity is estimated at \$100,000.

In crossing Cumberland County the storm seems to have disintegrated, since at Farmville, on the southern

edge of the county, three distinct storms were observed, and though the wind, rain, and hail continued, the losses in Cumberland County were moderate.

Only one death is known to have resulted from the storm, that of a colored woman, killed by lightning, near Overly. South of Overly, in the neighborhood of Rice Depot, the wind and hail again became violent, and large areas of tobacco were destroyed. Still farther south at Meherrin, on the southern edge of Prince Edward County, the hail was still the principal feature of the storm and this section also suffered greatly.

An accurate estimate of the loss sustained by the tobacco growers can not be made, since many of the leaves were picked up for curing and something may be saved from the suckers from thousands of plants that were cut off near the ground, but in the opinion of a grower well qualified to know the loss in the section within 30 miles of Farmville may well exceed \$1,000,000.